Chapter : 7. AREAS

Exercise : 7A

Question: 1

Given,

Base of triangle, b = 24 cm

Height of triangle = 14.5 cm

We have to find out the area of the given triangle

We know that,

Area of triangle = $\frac{1}{2}$ × base × height

$= \frac{1}{2} \times 24 \times 14.5$

= 174 cm^2

Hence, the area of the given triangle is 174 cm^2

Question: 2

It is given that the base of the triangular field is three times greater than its altitude

Let us assume height of the triangular field be x and base be 3x

We know that,

Area of triangle = $\frac{1}{2}$ × base × height

$= \frac{1}{2} \times x \times 3x$

$= \frac{3}{2} x^2$

We know that,

1 hectare = 10,000 sq metre

Given,

Rate of sowing the field per hectare = Rs. 58

Total cost of sowing the triangular field = Rs. 783

Therefore,

Total cost = Area of the triangular field × Rs. 58

$\frac{3}{2} x^2 \times \frac{58}{10000} = 783$

$x^2 = \frac{783}{58} \times \frac{2}{3} \times 10000$

$x^2 = 90000\, m^2$

x = 300 m

Hence,

Height of the triangular field = x = 300 m

Base of triangular field = 3x = 3 × 300 = 900 m

Question: 3

Given,

a = 42 cm

b = 34 cm

c = 20 cm

Therefore,

$S = \frac{42+34+20}{2}$

$= \frac{96}{2}$

= 48

We know that,

Area = $\sqrt{S\,(S-a)(S-b)(S-c)}$

Putting the values of a, b and c in the formula, we get

$= \sqrt{48\,(48-42)(48-34)(48-20)}$

$= \sqrt{48 \times 6 \times 14 \times 28}$

$= \sqrt{4 \times 4 \times 3 \times 3 \times 2 \times 14 \times 14 \times 2}$

= 4 × 3 × 2 × 14

= 336 cm^2

Longest side of the triangle = b = 42 cm

Let h be the corresponding height to the longest side

Therefore,

Area of triangle = $\frac{1}{2} \times b \times h$

336 = $\frac{1}{2} \times b \times h$

42 × h = 336 × 2

h = $\frac{336 \times 2}{42}$

= 16 cm

Hence, corresponding height of the triangle is 16 cm

Question: 4

Given,

a = 18 cm

b = 24 cm

c = 30 cm

Therefore,

s = $\frac{18+24+30}{2}$

= 36

We know that,

Area = $\sqrt{s\,(s-a)(s-b)\,(s-c)}$

$= \sqrt{36\,(36-18)(36-24)(36-30)}$

$= \sqrt{36 \times 18 \times 12 \times 6}$

$= \sqrt{6 \times 6 \times 6 \times 3 \times 3 \times 4 \times 6}$

= 6 × 6 × 3 × 2

= 216 cm^2

Smallest side = a = 18 cm

Let, h be the height corresponding to the smallest side of the triangle

Therefore,

Area of triangle $= \frac{1}{2} \times b \times h$

$216 = \frac{1}{2} \times b \times h$

18 × h = 216 × 2

$h = \frac{216 \times 2}{18}$

= 24 cm

Question: 5

Given,

a = 91 m

b = 98 m

c = 105 m

Therefore,

$s = \frac{91+98+105}{2}$

$= \frac{294}{2}$

= 147

We know that,

Area $= \sqrt{s\,(s-a)(s-b)(s-c)}$

$= \sqrt{147\,(147-91)(147-98)(147-105)}$

$= \sqrt{147 \times 56 \times 49 \times 42}$

$= \sqrt{49 \times 3 \times 7 \times 2 \times 2 \times 2 \times 49 \times 7 \times 3 \times 2}$

= 49 × 3 × 2 × 2 × 7

= 4116 m^2

Longest side = c = 105 cm

Let, h be the height corresponding to the longest side of the triangle

Area of triangle $= \frac{1}{2} \times b \times h$

$4116 = \frac{1}{2} \times b \times h$

4116 × 2 = 2 × 4116

$h = \frac{2 \times 4116}{105}$

= 78.4 m

Question: 6

Let the sides of the given triangle be 5x, 12x and 13x

Given,

Perimeter of the triangle = 150m

Perimeter of the triangle = (5x + 12x + 13x)

150 = 30x

Therefore,

$x = \frac{150}{30} = 5\ m$

Thus,

Sides of the triangle are:

5x = 5 × 5 = 25 m

12x = 12 × 5 = 60 m

13x = 13 × 5 = 65 m

Let,

a = 25 m, b = 60 m and c = 65 m

Therefore,

$s = \frac{1}{2}\ (a + b + c)$

$= \frac{1}{2}\ (25 + 60 + 65)$

$= \frac{1}{2}\ (150)$

= 75 m

We know that,

Area of triangle = $\sqrt{s\ (s-a)(s-b)(s-c)}$

$= \sqrt{75\ (75-25)(75-60)(75-65)}$

$= \sqrt{75 \times 50 \times 15 \times 10}$

$= \sqrt{25 \times 3 \times 25 \times 2 \times 5 \times 3 \times 5 \times 2}$

$= \sqrt{25 \times 25 \times 5 \times 5 \times 3 \times 3 \times 2 \times 2}$

= 25 × 5 × 3 × 2

= 750 sq m

Hence, area of triangle is 750 sq m.

Question: 7

x = 10 m

Thus, sides of the triangle are:

25x = 25 × 10 = 250 m

17x = 17 × 10 = 170 m

12x = 12 × 10 = 120 m

Let,

a = 250 m, b = 170 m and c = 120 m

Therefore,

s = $\frac{1}{2}(a+b+c)$

= $\frac{1}{2}(250+170+120)$

= $\frac{1}{2}(540)$

= 270 m

Therefore,

Area of triangle= $\sqrt{s\,(s-a)(s-b)(s-c)}$

= $\sqrt{270\,(270-250)(270-170)(270-120)}$

= $\sqrt{3\times3\times3\times10\times10\times2\times10\times10\times10\times5\times3}$

= 3 × 3 × 10 × 10 × 10

= 9000 m^2

Cost of ploughing the field at the rate of Rs. 18.80 per 10 m^2 = $\frac{18.80}{10}\times 9000$

= Rs. 16920

Therefore, cost of ploughing the field is Rs. 16920

Question: 8

Given,

First side of the triangular field = 85 m

Second side of the triangular field = 154 m

Let the third side be x

Perimeter of the triangular field = 324 m

85 m + 154 m + x = 324 m

x = 324 – 239

x = 85 m

Let the three sides of the triangle be:

a = 85 m, b = 154n m and c = 85 m

Now,

s = $\frac{1}{2}(a+b+c)$

= $\frac{(85+154+85)}{2}$

= $\frac{324}{2}$

= 162

We know that,

Area of triangle = $\sqrt{s\,(s-a)(s-b)(s-c)}$

$= \sqrt{162 \times 77 \times 8 \times 77}$

$= \sqrt{2 \times 9 \times 9 \times 11 \times 2 \times 2 \times 2 \times 7 \times 11}$

$= \sqrt{11 \times 11 \times 9 \times 9 \times 7 \times 7 \times 2 \times 2 \times 2 \times 2}$

= 11 × 9 × 7 × 2 × 2

= 2771 m^2

We also know that,

Area of triangle = $\frac{1}{2} \times base \times height$

2772 = $\frac{1}{2} \times 154 \times h$

2772 = 77h

h = $\frac{2772}{77}$

h = 36 m

Therefore,

The length of the perpendicular from the opposite vertex on the side measuring 154 m is 36 m.

Question: 9

Let,

a = 13 cm

b = 13 cm

And,

C = 20 cm

Now,

s = $\frac{1}{2}\ (a + b + c)$

= $\frac{(13+13+20)}{2}$

= $\frac{46}{2}$ = 23 cm

We know that,

Area of triangle = $\sqrt{s\ (s-a)(s-b)(s-c)}$

= $\sqrt{23\ (23-13)(23-13)(23-20)}$

= $\sqrt{23 \times 10 \times 10 \times 3}$

= $10\sqrt{69}$

= 10 × 8.306

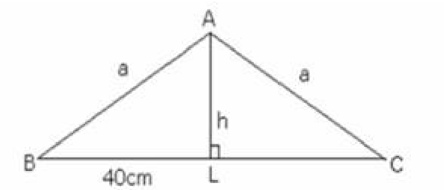
= 83.06 cm^2

Therefore,

Area of isosceles triangle = 83.06 cm^2

Question: 10

Let us assume ΔABC be an isosceles triangle and let AL perpendicular BC



It is given that,

BC = 80 cm

Area of triangle ABC = 360 cm^2

We know that,

Area of triangle = $\frac{1}{2} \times base \times height$

$\frac{1}{2} \times BC \times AL$ = 360 cm^2

$\frac{1}{2} \times 80 \times h$ = 360 cm^2

$40 \times h$ = 360 cm^2

$h = \frac{360}{40}$

= 9 cm

Now,

BL = $\frac{1}{2}$ (BC)

= $(\frac{1}{2} \times 80)$

= 40 cm

a = $\sqrt{BL^2 + AL^2}$

= $\sqrt{(40)^2 + (9)^2}$

= $\sqrt{1600 + 81}$

= $\sqrt{1681}$

= 41 cm

Therefore,

Perimeter of the triangle = (41 + 41 + 80) = 162 cm

Question: 11

We know that,

In any isosceles triangle, the lateral sides are of equal length

Let,

The lateral side of the triangle be x

Given,

Base of the triangle = $\frac{3}{2} \times x$

(i) We have to find out length of each side of the triangle:

Perimeter of the triangle = 42 cm (Given)

x + x + $\frac{3}{2}x$ = 42 cm

$2x + 2x + 3x = 84$ cm

$7x = 84$ cm

$x = \frac{84}{7}\ cm$

$x = 12$ cm

Therefore,

Length of lateral side of the triangle = x = 12 cm

Base $= \frac{3}{2} \times x = \frac{3}{2} \times 12$

= 18 cm

Hence,

Length of each side of the triangle is 12 cm, 12 cm and 18 cm

(ii) Now, we have to find out area of the triangle:

Let,

a = 12 cm

b = 12 cm

And,

c= 18 cm

Now,

$s = \frac{1}{2}\ (a + b + c)$

$= \frac{1}{2}\ (12 + 12 + 18)$

$= \frac{1}{2}\ (42)$

= 21 cm

We know that,

Area of triangle $= \sqrt{s\ (s-a)(s-b)(s-c)}$

$= \sqrt{21\ (21-12)(21-12)(21-18)}$

$= \sqrt{21 \times 9 \times 9 \times 3}$

$= \sqrt{3 \times 7 \times 9 \times 9 \times 3}$

$= 27\sqrt{7}$

= 71.42 cm^2

Therefore, area of the given triangle is 71.42 cm^2

(iii) We have to calculate height of the triangle:

We know that,

Area of triangle $= \frac{1}{2} \times base \times height$

71.42 $cm^2 = \frac{1}{2} \times 18 \times h$

71.42 $cm^2 = 9 \times h$

$h = \frac{71.42}{9} = 7.94$ cm

Therefore, height of the triangle is 7.94 cm

Question: 12

Given,

Area of the equilateral triangle = $36\sqrt{3}$ cm^2

Let us assume a be the length of the side of an equilateral triangle

We know that,

Area of an equilateral triangle = $\frac{\sqrt{3} \times a^2}{4}$ sq units

$36\sqrt{3} = \frac{\sqrt{3} \times a^2}{4}$

$a^2 = \frac{36 \times \sqrt{3} \times 4}{\sqrt{3}}$

$a^2 = 36 \times 4$

$a^2 = 144$

a = 12 cm

We know that,

Perimeter of an equilateral triangle = 3 × a

= 3 × 12

= 36 cm

Hence, perimeter of the given equilateral triangle is 36 cm.

Question: 13

Let us assume a be the side of the equilateral triangle

We know that,

Area of an equilateral triangle = $\frac{\sqrt{3}}{4} a^2$ sq units

It is given that,

Area of the equilateral triangle = $81\sqrt{3}$ cm^2

$81\sqrt{3}$ cm^2 = $\frac{\sqrt{3}}{4} a^2$

$a^2 = \frac{81\sqrt{3} \times 4}{\sqrt{3}} = 324$

$a = \sqrt{324} = 18$ cm

Height of an equilateral triangle = $\frac{\sqrt{3}}{2}$ a

Since, the value of a is 18 cm

Therefore,

Height = $\frac{\sqrt{3}}{2} \times 18$

= $9\sqrt{3}$ cm

Question: 14

Given that,

Base = BC = 48 cm

Hypotenuse = AC = 50 cm

Let us assume AB = x cm

By using Pythagoras theorem, we get

$AC^2 = AB^2 + BC^2$

Putting the value of BC, AC and AB we get:

$50^2 = x^2 + 48^2$

$x^2 = 50^2 - 48^2$

$x^2 = 2500 – 2304$

$x^2 = 196$

$x = \sqrt{196}$

x = 14 cm

We know that,

Area of right angle triangle = $\frac{1}{2} \times base \times height$

$= \frac{1}{2} \times 48 \times 14$

$= 24 \times 14$

$= 336\ cm^2$

Question: 15

(i) We know that,

Area of an equilateral triangle = $\frac{\sqrt{3}}{4} a^2$ sq units

It is given that, each side of equilateral triangle is of 8 cm

Therefore,

Area = $\frac{\sqrt{3}}{4} \times 8^2$

$= \frac{\sqrt{3}}{4} \times 64$

$= \sqrt{3} \times 16$

$= 1.732 \times 16$

= 27.712

$= 27.71\ cm^2$ (Up to 2 decimal places)

(ii) We also know that,

Height of an equilateral triangle = $\frac{\sqrt{3}}{2}$ a

$= \frac{\sqrt{3}}{2} \times 8$

$= \sqrt{3} \times 4$

$= 1.732 \times 4$

= 6.928

= 6.93 cm (Up to 2 decimal places)

Question: 16

Let us assume a be the side of the equilateral triangle

We know that,

Height of an equilateral triangle = $\frac{\sqrt{3}}{2}$ a units

Height 0f the equilateral triangle = 9 cm (Given)

$\frac{\sqrt{3}}{2}a = 9$

$a = \frac{9 \times 2}{\sqrt{3}}$

$= \frac{9 \times 2 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}}$ (Rationalizing the denominator)

$= \frac{9 \times 2\sqrt{3}}{\sqrt{3} \times \sqrt{3}}$

$= 6\sqrt{3}$

Base of the triangle = $6\sqrt{3}$

We know that,

Area of triangle = $\frac{1}{2} \times base \times height$

$= \frac{1}{2} \times 6\sqrt{3} \times 9$

$= 27\sqrt{3}$

= 27 × 1.732

= 46.76 cm^2 (Up to 2 decimal places)

Question: 17

Let the sides of the triangle be,

a = 50 cm

b = 20 cm

And

C = 50 cm

Now, let us find the value of s:

s = $\frac{1}{2}(a + b + c)$

$= \frac{1}{2}(50 + 20 + 50)$

= 60 cm

We know that,

Area = $\sqrt{s\,(s - a)(s - b)(s - c)}$

Area of one triangular piece of cloth = $\sqrt{60\,(60 - 50)(60 - 20)(60 - 50)}$

$= \sqrt{60 \times 10 \times 40 \times 10}$

$= \sqrt{6 \times 10 \times 10 \times 4 \times 10 \times 10}$

$= \sqrt{10 \times 10 \times 10 \times 10 \times 2 \times 2 \times 2 \times 3}$

$= 10 \times 10 \times 2\sqrt{6}$

$= 200\sqrt{6}$

$= 200 \times 2.45$

$= 490$ cm^2

Therefore,

Area of one piece of cloth = 490 cm^2

Hence,

Area of 12 pieces of cloth = 12 × 490

= 5880 cm^2

Question: 18

Let the sides of the triangle be:

a = 16 cm

b = 12 cm

And,

c = 20 cm

Now we have to find out the value of s:

s $= \frac{1}{2}\ (a + b + c)$

$= \frac{1}{2}\ (16 + 12 + 20)$

$= \frac{48}{2}$ = 24 cm

We know that,

Area of triangle = $\sqrt{s\ (s - a)(s - b)(s - c)}$

Therefore,

Area of triangular tile = $\sqrt{24\ (24 - 16)(24 - 12)(24 - 20)}$

$= \sqrt{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3}$

$= 2 \times 2 \times 2 \times 2 \times 2 \times 3$

= 96 cm^2

Therefore,

Area of one tile = 96 cm^2

Hence,

Area of 16 such tiles = 96 × 16 = 1536 cm^2

Now,

Cost of polishing the tiles per square cm = Rs. 1

Therefore,

Total cost of polishing the tiles = 1 × 1536

= Rs. 1536

Question: 19

By using Pythagoras theorem in right triangle ABC, we get

BC= $\sqrt{AB^2 - AC^2}$

= $\sqrt{17^2 - 15^2}$

= $\sqrt{289 - 225}$

= $\sqrt{64}$

= 8 cm

Let us first find out the perimeter of the given quadrilateral

Perimeter of quadrilateral ABCD = 17 + 9 + 12 + 8 = 46 cm

We know that,

Area of triangle ABC = $\frac{1}{2} \times base \times height$

= $\frac{1}{2} \times BC \times AC$

= $\frac{1}{2} \times 8 \times 15$

= 60 cm^2

Now,

For area of triangle ACD, we have

a = 15 cm

b = 12 cm

And,

c = 9 cm

Therefore,

s = $\frac{a+b+c}{2}$

= $\frac{15+12+9}{2}$

= 18 cm

Now,

Area of triangle ACD = $\sqrt{s\,(s-a)(s-b)(s-c)}$

= $\sqrt{18\,(18-15)(18-12)(18-9)}$

= $\sqrt{18 \times 3 \times 6 \times 9}$

= $\sqrt{18 \times 18 \times 3 \times 3}$

= 18 × 3

= 54 cm^2

Therefore,

Area of quadrilateral ABCD = Area of triangle ABC + Area of triangle ACD

= 60 + 54

$= 114\ cm^2$

Question: 20

Firstly, let us calculate the perimeter of the given quadrilateral

Perimeter of quadrilateral ABCD = 34 + 29 + 21 + 42 = 126 cm

We know that,

Area of triangle = $\frac{1}{2} \times base \times height$

Area of triangle BCD = $\frac{1}{2} \times 20 \times 21$

$= 210\ cm^2$

Now, we have to calculate the area of triangle ABD,

For this, we have

a = 42 cm

b = 20 cm

c = 34 cm

Therefore,

s = $\frac{42+20+34}{2}$

$= \frac{96}{2}$

= 48 cm

We know that,

Area of triangle = $\sqrt{s\ (s-a)(s-b)(s-c)}$

Therefore,

Area of triangle ABD = $\sqrt{48\ (48-42)(48-20)(48-34)}$

$= \sqrt{48 \times 6 \times 28 \times 14}$

$= \sqrt{16 \times 3 \times 3 \times 2 \times 2 \times 14 \times 14}$

= 4 × 3 × 2 × 14

$= 336\ cm^2$

Hence,

Area of quadrilateral ABCD = Area of triangle ABD + Area of triangle BCD

= 336 + 210

$= 546\ cm^2$

Question: 21

Let us consider a right triangle ABD,

By using Pythagoras theorem in this, we get

AB = $\sqrt{AB^2 - AD^2}$

$= \sqrt{26^2 - 24^2}$

$= \sqrt{676 - 576}$

= 10 cm

We know that,

Area of triangle = $\frac{1}{2} \times base \times height$

$= \frac{1}{2} \times 10 \times 24$

= 120 cm^2

We also know that,

Area of an equilateral triangle BCD = $\frac{\sqrt{3}}{4} a^2$ sq units

$= \frac{1.73}{4} \times (26)^2$

= 292.37 cm^2

Therefore,

Area of quadrilateral ABCD = Area of triangle ABD + Area of triangle BCD

= 120 + 292.37

= 412.37 cm^2

Question: 22

Let the sides of the triangle ABC be:

a = 26 cm

b = 30 cm

And

c = 28 cm

Let us find out the value of s

We know that,

s = $\frac{1}{2}\ (a + b + c)$

$= \frac{1}{2}\ (26 + 30 + 28)$

$= \frac{84}{2}$

= 42 cm

We know that,

Area of triangle ABC = $\sqrt{s\ (s-a)(s-b)(s-c)}$

$= \sqrt{42\ (42-26)(42-30)(42-28)}$

$= \sqrt{42 \times 16 \times 12 \times 14}$

$= \sqrt{14 \times 3 \times 16 \times 4 \times 3 \times 14}$

$= \sqrt{14 \times 14 \times 3 \times 3 \times 16 \times 4}$

= 14 × 3 × 4 × 2

= 336 cm^2

We know that,

In a parallelogram, the diagonal divides the parallelogram in two equal area

Therefore,

Area of quadrilateral ABCD = Area of triangle ABC + Area of triangle ACD

= Area of triangle ABC × 2

= 336 × 2

= 672 cm^2

Question: 23

$\frac{a+b+c}{2}$

$= \frac{10+16+14}{2}$

$= \frac{40}{2}$

= 20 cm

Now,

Area of ΔABC = $\sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{20(20-10)(20-16)(20-14)}$

$= \sqrt{20 \times 10 \times 6 \times 4}$

= 40√3 cm^2

We know that, the diagonal of a parallelogram divides it into two triangles of equal areas.

Hence,

Area of quadrilateral ABCD = Area of ΔABC + Area of ΔACD

= Area of ΔABC × 2

= 40√3 × 2

= 80√3 cm^2

= 138.4 cm^2

Question: 24

$\frac{1}{2} \times base \times height$

$= \frac{1}{2} \times BD \times AL$

$= \frac{1}{2} \times 64 \times 16.8$

= 537.6 cm^2

Area of ΔBCD = $\frac{1}{2} \times base \times height$

$= \frac{1}{2} \times BD \times CM$

$= \frac{1}{2} \times 64 \times 13.2$

= 422.4 cm^2

Now,

Area of quadrilateral ABCD = Area of ΔABD + Area of ΔBCD

= 537 + 422.4

$= 960\ cm^2$

Exercise : CCE QUESTIONS

Question: 1

In a ΔABC it is g

Solution:

We have,

Base of triangle = 12 cm

Height of triangle = 5 cm

We know that,

Area of triangle = $\frac{1}{2} \times \text{Base} \times \text{Height}$

$= \frac{1}{2} \times 12 \times 5$

$= 6 \times 5$

$= 30\ cm^2$

Hence, option (b) is correct

Question: 2

The length of thr

Solution:

Let the threes ides of the triangle be,

a = 20 cm, b = 16 cm and c = 12 cm

Now, s = $\frac{a+b+c}{2}$

$= \frac{20+16+12}{2}$

$= \frac{48}{2}$

= 24 cm

Now, by using Heron’s formula we have:

Area of triangle = $\sqrt{s\,(s-a)(s-b)(s-c)}$

$= \sqrt{24\,(24-20)(24-16)(24-12)}$

$= \sqrt{24 \times 4 \times 8 \times 12}$

$= \sqrt{6 \times 4 \times 4 \times 4 \times 4 \times 6}$

$= 6 \times 4 \times 4$

$= 96\ cm^2$

Hence, option (a) is correct

Question: 3

Each side of an e

Solution:

It is given in the question that,

Side of equilateral triangle = 8 cm

We know that,

Area of equilateral triangle = $\frac{\sqrt{3}}{4} \times (\text{Side})^2$

$= \frac{\sqrt{3}}{4} \times (8)^2$

$= \frac{\sqrt{3}}{4} \times 64$

$= 16\sqrt{3}$ cm^2

Hence, option (b) is correct

Question: 4

The base of an is

Solution:

We know that,

Area of an isosceles triangle = $\frac{b}{4}\sqrt{4a^2 - b^2}$

It is given that,

a = 6 cm and b = 8 cm

∴ we have:

$\frac{8}{4} \times \sqrt{4\,(6)^2 - 8^2}$

$= \frac{8}{4} \times \sqrt{144 - 64}$

$= \frac{8}{4} \times \sqrt{80}$

$= \frac{8}{4} \times 4\sqrt{5}$

$= 8\sqrt{5}$ cm^2

Hence, option (b) is correct

Question: 5

The base of an is

Solution:

It is given in the question that,

Base of the isosceles triangle = b = 6 cm

Two equal sides = a = 5 cm

We know that,

Height of an isosceles triangle = $\frac{1}{2} \times \sqrt{4a^2 - b^2}$

$= \frac{1}{2} \times \sqrt{4\,(5)^2 - 6^2}$

$= \frac{1}{2} \times \sqrt{100 - 36}$

$= \frac{1}{2} \times \sqrt{64}$

$= \frac{1}{2} \times 8$

= 4 cm

Hence, option (c) is correct

Question: 6

Each of the two e

Solution:

From the given question, we have

Base of triangle = 10 cm

Height of triangle = 10 cm

∴ Area of triangle = $\frac{1}{2} \times \text{Base} \times \text{Height}$

= $\frac{1}{2} \times 10 \times 10$

= 5 × 10

= 50 cm^2

Hence, option (b) is correct

Question: 7

Each side of an e

Solution:

We have,

Each side of the equilateral triangle = 10 cm

We know that,

In an equilateral triangle altitude divides its base into 2 equal parts

∴ $\frac{1}{2} \times 10 = 5$ cm

Let the height be h

Now, by using Pythagoras theorem

$10^2 = 5^2 + h^2$

$100 = 25 + h^2$

$h^2 = 100 - 25$

$h^2 = 75$

h = $\sqrt{75}$

h = $5\sqrt{3}$ cm

Hence, height of the triangle is $5\sqrt{3}$ cm

Thus, option (b) is correct

Question: 8

The height of an

Solution:

It is given in the question that,

Height of an equilateral triangle = 6 cm

Let the side of triangle be a

Then, the altitude of the equilateral triangle is given as:

$\therefore$ Altitude = $\frac{\sqrt{3}}{2}a$

Put altitude = 6 cm we get,

$6 = \frac{\sqrt{3}}{2} \times a$

$a = \frac{12}{\sqrt{3}}$

$a = 4\sqrt{3}$ cm

$\therefore$ Area of triangle = $\frac{\sqrt{3}}{4} \times (\text{Side})^2$

$= \frac{\sqrt{3}}{4} \times \left(4\sqrt{3}\right)^2$

$= \frac{\sqrt{3}}{4} \times 16 \times 3$

$= 12\sqrt{3}$ cm^2

Hence, option (a) is correct

Question: 9

The length of the

Solution:

It is given in the question that,

Sides of the triangle = 40 m, 24 m and 32 m

$\therefore$ Semi-perimeter, s = $\frac{40+24+32}{2}$

$= \frac{96}{2}$

= 48 cm

Now, by using Heron’s formula we get:

Area of triangle = $\sqrt{48\,(48-40)(48-24)(48-32)}$

$= \sqrt{48 \times 8 \times 24 \times 16}$

$= \sqrt{147456}$

= 384 m^2

Hence, option (c) is correct

Question: 10

The sides of the

Solution:

It is given in the question that,

The sides of given triangle are in the ratio 5: 12: 13

Let the sides be 5x, 12x and 13x

According to the question,

5x + 12x + 13 x = 150

30x = 150

$x = \frac{150}{30}$

$x = 5$

So, $5x = 25$

$12x = 60$

$13x = 65$

Semi-perimeter $= \frac{25+60+65}{2}$

$= \frac{150}{2}$

= 75 cm

Now, by using Heron's formula we get:

Area of triangle $= \sqrt{75\ (75-25)(75-60)(75-65)}$

$= \sqrt{75 \times 50 \times 15 \times 10}$

$= \sqrt{562500}$

= 750 cm^2

Hence, option (b) is correct

Question: 11

The lengths of th

Solution:

It is given in the question that,

Sides of the triangle = 30 cm, 24 cm and 18 cm

Let h be the altitude of the triangle

$\therefore$ Semi-perimeter $= \frac{30+24+18}{2}$

$= \frac{72}{2}$

= 36 cm

Now, Area of triangle $= \sqrt{36\ (36-30)(36-24)(36-18)}$

$= \sqrt{36 \times 6 \times 12 \times 18}$

$= \sqrt{46656}$

= 216 cm^2

Also, Area $= \frac{1}{2} \times \text{Base} \times \text{Height}$

$216 = \frac{1}{2} \times 18 \times h$

$216 = 9 \times h$

$h = \frac{216}{9}$

= 24 cm

Hence, option (a) is correct

Question: 12

The base of an is

Solution:

It is given in the question that,

Base of the triangle = 16 cm

Area of the triangle = 48 cm^2

Let the height of the triangle be h

We know that,

Area of the triangle = $\frac{1}{2} \times \text{Base} \times \text{Height}$

$48 = \frac{1}{2} \times 16 \times h$

48 = 8 × h

$h = \frac{48}{8}$

h = 6 cm

Now, half of the base = $\frac{16}{2}$ = 8 cm

∴ By using Pythagoras theorem, we have

$Side^2 = 8^2 + 6^2$

= 64 + 36

= 100

= 10 cm

Now, perimeter of the triangle = Sum of all sides

= 10 + 10 + 16

= 36 cm

Hence, option (b) is correct

Question: 13

The area of an eq

Solution:

It is given in the question that,

Area of an equilateral triangle = $36\sqrt{3}$ cm^2

We know that,

Area of an equilateral triangle = $\frac{\sqrt{3}}{4} \times (\text{Side})^2$

$36\sqrt{3} = \frac{\sqrt{3}}{4} \times (\text{Side})^2$

$(\text{Side})^2 = 144$

Side = 12 cm

∴ Perimeter of equilateral triangle = 3 × Side

= 3 × 12

= 36 cm

Hence, option (a) is correct

Question: 14

Each of the equal

Solution:

It is given in the question that,

Equal sides of isosceles triangle = 13cm

Base = 24 cm and $\frac{1}{2}(\text{Base})$ = 12 cm

Let the height of the triangle be h

$\therefore (13)^2 = (12)^2 + h^2$

$169 = 144 + h^2$

$h^2 = 169 - 144$

$h^2 = 25$

h = 5

Thus, area of triangle = $\frac{1}{2} \times \text{Base} \times \text{Height}$

$= \frac{1}{2} \times 24 \times 5$

$= 12 \times 5$

$= 60 \text{ cm}^2$

Hence, option (c) is correct

Question: 15

The base of a rig

Solution:

Base of right angled triangle = 48 cm

Hypotenuse of triangle = 50 cm

Now, by using pythagoras theorem we get:

$\text{Hypotenuse}^2 = \text{Base}^2 + \text{Height}^2$

$(50)^2 = (48)^2 - h^2$

$2500 = 2304 - h^2$

$h^2 = 2500 - 2304$

$h^2 = 196$

h = 14 cm

Now, Area of triangle = $\frac{1}{2} \times \text{Base} \times \text{Height}$

$= \frac{1}{2} \times 14 \times 48$

$= 7 \times 48$

$= 336 \text{ cm}^2$

Hence, option (c) Is correct

Question: 16

The area of an eq

Solution:

It is given in the question that,

Area of an equilateral triangle = $81\sqrt{3}$ cm^2

Let a be the side of the triangle and h be the height

We know that,

Area of an equilateral triangle = $\frac{\sqrt{3}}{4}$ a^2

$81\sqrt{3} = \frac{\sqrt{3}}{4} \times a^2$

$a^2 = 81 \times 4$

a = 18

Also, Area of triangle = $\frac{1}{2} \times \text{Base} \times \text{Height}$

$81\sqrt{3} = \frac{1}{2} \times 18 \times h$

$h = \frac{81\sqrt{3}}{9}$

h = $9\sqrt{3}$ cm

Hence, option (a) is correct

Question: 17

The difference be

Solution:

Let the semi-perimeter be s

Let the sides of the triangle be a, b and c

It is given in the question that,

s – a = 8 …(i)

s – b = 7 …(ii)

s – c = 5 …(iii)

Now, by adding (i), (ii) and (iii) we get:

(s – a) + (s – b) + (s – c) = 8 + 7 + 5

3s – a – b – c = 20

3s – (a + b + c) = 20

We know that,

$s = \frac{a+b+c}{2}$

∴ 3s – 2s = 20

s = 20 cm

Now, area of the triangle = $\sqrt{s\,(s-a)(s-b)(s-c)}$

$= \sqrt{20(8)(7)(5)}$

= $20\sqrt{14}$ cm^2

Hence, option (c) is correct

Question: 18

For an isosceles

Solution:

We know that,

Area of triangle = $\frac{1}{2} \times$ Base $\times$ Height

$= \frac{1}{2} \times a \times a$

$= \frac{1}{2} \times a^2$

Now, Hypotenuse = $\sqrt{a^2 + a^2}$

$= \sqrt{2a^2}$

$= \sqrt{2}a$

Perimeter = a + a + $\sqrt{2}a$

= 2a + $\sqrt{2}a$

= a (2 + $\sqrt{2}$)

∴ I and II are true

Hence, option (c) is correct

Question: 19

For an isosceles

Solution:

According to question, we have:

Base of triangle = b

Equal sides of triangle = a

∴ Area = $\frac{b\sqrt{4a^2 - b^2}}{4}$

Perimeter = (2a + b)

And, Height = $\frac{1}{2}\sqrt{4a^2 - b^2}$

∴ I, II and III are true

Hence, option (d) is correct

Question: 20

The question cons

Solution:

In the given question, we have:

Area of equilateral triangle = $\frac{\sqrt{3}}{4} \times (\text{Side})^2$

$= \frac{\sqrt{3}}{4} \times (4)^2$

$= \frac{\sqrt{3}}{4} \times 16$

$= 4\sqrt{3}$ cm^2

Also, Area of an equilateral triangle having each side a = $\frac{\sqrt{3}}{4}a^2$ sq units

∴ Both Assertion and Reason are true

Hence, option (a) is correct

Question: 21

The question cons

Solution:

In the given question, we have

Area of isosceles triangle = $\frac{b}{4}\sqrt{4a^2 - b^2}$

Here, we have:

a = 5 cm and b = 8 cm

∴ $\frac{8}{4} \times \sqrt{4\,(5)^2 - 8^2}$

= 2 × $\sqrt{100 - 64}$

= 2 × $\sqrt{36}$

= 2 × 6

= 12 cm^2

Also, Area of an isosceles triangle having each of the equal sides as a and base b = $\frac{1}{4}b\sqrt{4a^2 - b^2}$

∴ Both Assertion and Reason are true

Hence, option (a) is correct

Question: 22

The question cons

Solution:

In this question, we have

Area of an equilateral triangle = $\frac{\sqrt{3}}{4} \times (\text{Side})^2$

= $\frac{\sqrt{3}}{4} \times (4)^2$

= $\frac{\sqrt{3}}{4} \times 16$

= $4\sqrt{3}$ cm^2

Also, Area of an equilateral triangle having each side a = $\frac{\sqrt{3}}{4}a^2$sq units

Thus, assertion is false whereas reason is true

Hence, option (d) is correct

Question: 23

The question cons

Solution:

In the given question,

Let us assume the sides of the triangle be 2x, 3x and 4x

We know that,

Perimeter of triangle = Sum of all sides

$36 = 2x + 3x + 4x$

$36 = 9x$

$x = \frac{36}{9}$

$x = 4$

∴ Sides of the triangle are:

$2x = 2 \times 4 = 8$ cm

$3x = 3 \times 4 = 12$ cm

$4x = 4 \times 4 = 16$ cm

Let, a = 8 cm, b = 12 cm and c = 16 cm

So, $s = \frac{a+b+c}{2}$

$= \frac{8+12+16}{2}$

$= \frac{36}{2}$

= 18 cm

Now, by using Heron's formula we have:

Area of triangle = $\sqrt{s\,(s-a)(s-b)(s-c)}$

$= \sqrt{18\,(18-8)(18-12)(18-16)}$

$= \sqrt{18 \times 10 \times 6 \times 2}$

$= \sqrt{6 \times 3 \times 5 \times 2 \times 6 \times 2}$

$= 6 \times 2\sqrt{15}$

$= 12\sqrt{15}$ cm^2

Also, if $2s = (a + b + c)$

Where a, b and c are the sides of the triangle then:

Area = $\sqrt{(s-a)(s-b(\,(s-c)}$ which is false as it should be:

Area = $\sqrt{s\,(s-a)(s-b(\,(s-c)}$

∴ Assertion is true whereas reason is false

Hence, option (c) is correct

Question: 24

The question cons

Solution:

From the given question, we have

a = 24 cm, b = 13 cm and c = 13 cm

∴ $s = \frac{a+b+c}{2}$

$= \frac{24+13+13}{2}$

$= \frac{50}{2}$

= 25 cm

Now, by using heron's formula we have:

Area of triangle = $\sqrt{s\ (s-a)(s-b)(s-c)}$

$= \sqrt{25\ (25-24)(25-13)(25-13)}$

$= \sqrt{25 \times 1 \times 12 \times 12}$

= 5 × 12

= 60 cm^2

Also, if 2s = (a + b + c) where a, b and c are the sides of the triangle then:

Area = $\sqrt{s\ (s-a)(s-b(\ (s-c)}$

∴ Assertion and reason both are correct

Hence, option (a) is correct

Question: 25

If the base of an

Solution:

It is given in the question that,

Base of the triangle, b = 6 cm

Equal sides of the isosceles triangle = a cm

Perimeter = 16 cm

We know that,

Perimeter = Sum of all sides

16 = a + a + 6

16 = 2a + 6

2a = 10

$a = \frac{10}{2}$

a = 5 cm

∴ Area of an isosceles triangle = $\frac{b}{4}\sqrt{4a^2 - b^2}$

$= \frac{6}{4}\sqrt{4\ (5)^2 - 6^2}$

$= 1.5 \times \sqrt{100-36}$

$= 1.5 \times \sqrt{64}$

= 1.5 × 8

= 12 cm^2

Hence, the given statement is true

Question: 26

If each side of a

Solution:

It is given in the question that,

Each side of an equi8lateral triangle = 8 cm

Area of an equilateral triangle = $\frac{\sqrt{3}}{4} \times (\text{Side})^2$

$= \frac{\sqrt{3}}{4} \times (8)^2$

$= \frac{\sqrt{3}}{4} \times 64$

$= 16\sqrt{3}$ cm^2

Hence, the given statement is false

Question: 27

If the sides of a

Solution:

Let the sides of the triangular field be:

a = 52 m, b = 37 m and c = 20 m

$\therefore$ s $= \frac{a+b+c}{2}$

$= \frac{51+37+20}{2}$

$= \frac{108}{2}$

= 54 m

Now, by using Heron's formula we get:

Area of triangle = $\sqrt{s\,(s-a)(s-b)(s-c)}$

$= \sqrt{54\,(54-51)(54-37)(54-20)}$

$= \sqrt{54 \times 3 \times 17 \times 34}$

$= \sqrt{3 \times 3 \times 3 \times 2 \times 3 \times 17 \times 17 \times 2}$

= 17 × 2 × 3 × 3

= 306 m^2

It is given that,

Cost of leveling 1 m^2 area = Rs 5

$\therefore$ Cost of leveling 306 m^2 area = 5 × 306

= Rs 1530

Hence, the given statement is true

Question: 28

Match the followi

Solution:

The correct match for the table is as follows:

Column I	Column II
(a) The lengths of three sides of a triangle are 26 cm, 28 cm and 30cm. The height corresponding to base 28cm is……cm	(r) 24
(b) The area of an equilateral triangle is $4\sqrt{3}$ cm^2. The perimeter of the triangle is…..cm	(s) 12
(c) If the height of an equilateral triangle is $3\sqrt{3}$ cm, then each side of the triangle measures …. Cm	(p) 6
(d) Let the base of an isosceles triangle be 6 cm and each of the equal side be 5cm. Then, its height is ….cm	(q) 4

Question: 29

A park in the sha

Solution:

rom the given figure, it is clear that:

BCD is a right triangle

$\therefore$ BD = $\sqrt{BC^2 + CD^2}$

= $\sqrt{12^2 + 5^2}$

= $\sqrt{144 + 25}$

= $\sqrt{169}$

= 13 m

Now, area of$\Delta BCD = \frac{1}{2} \times \text{Base} \times \text{Height}$

= $\frac{1}{2} \times BC \times CD$

= $\frac{1}{2} \times 12 \times 5$

= 6 × 5 = 30 m^2

Let the sides of the triangle be: a = 9 m, b = 8 m and c = 13 m

$\therefore$ s = $\frac{a+b+c}{2}$

= $\frac{9+8+13}{2}$

= $\frac{30}{2}$ = 15 m

Thus, by using Heron's formula we get:

Area of $\Delta ABD = \sqrt{s\,(s-a)(s-b)(s-c)}$

= $\sqrt{15\,(15-9)(15-8)(15-13)}$

= $\sqrt{15 \times 6 \times 7 \times 2}$

= $\sqrt{5 \times 3 \times 3 \times 2 \times 7 \times 2}$

= $3 \times 2\sqrt{35}$

= $6\sqrt{35}$

= 6 × 5.9 = 35.4 m^2

$\therefore$ Area of quadrilateral ABCD = Area of ΔBCD + Area of ΔABD

= 30 + 35.4

= 65.4 m^2

Question: 30

Find the area of

Solution:

Let the sides of the triangle ABC be:

a = 40 cm, b = 80 cm and c = 60 cm

$\therefore$ s = $\frac{a+b+c}{2}$

= $\frac{40+80+60}{2}$

= $\frac{180}{2}$

= 90 cm

Now, by using Heron's formula we get:

Area of $\Delta ABC = \sqrt{s\,(s-a)(s-b)(s-c)}$

= $\sqrt{90\,(90-40)(90-80)(90-60)}$

= $\sqrt{90 \times 50 \times 10 \times 30}$

= $\sqrt{30 \times 3 \times 10 \times 5 \times 10 \times 30}$

= $30 \times 10\sqrt{15}$

= 300 × 3.87

= 1161 cm^2

As we know that, the diagonal of a parallelogram divides it into two triangles of equal areas

$\therefore$ Area of parallelogram (ABCD) = 2 × Area of (ΔABC)

= 2 × 1161

= 2322 cm^2

Question: 31

A piece of land i

Solution:

Let the sides of triangle be 100m, 160m, and 100m

Semi perimeter, $s = \frac{100+160+100}{2} = \frac{360}{2} = 180$ m

Now, using Heron's formula,

$Area\ of\ \Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{180(180-100)(180-160)(180-100)}$

$= \sqrt{180(80)(20)(80)}$

$= \sqrt{4800 \times 4800}$

= 4800 m^2

Now, we know that, diagonal divides a parallelogram into two triangles of equal areas.

Area of parallelogram ABCD = 2(area of ΔABC)

= 2 × 4800

= 9600 m^2

Question: 32

A floral design o

Solution:

Let the sides of triangle be 9 cm, 28 cm, and 35 cm

Semi perimeter, $s = \frac{9+28+35}{2} = \frac{72}{2} = 36$ cm

Now, using Heron's formula,

Area of $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$ (Area of 1 tile)

$= \sqrt{36(36-9)(36-28)(36-35)}$

$= \sqrt{36(8)(27)(1)}$

$= \sqrt{4 \times 9 \times 3 \times 9 \times 2 \times 4}$

$= 9 \times 4\sqrt{3}$ = 88.2cm^2

$\therefore$ Area of 16 tiles = 16 × area of one tile

= 16 × 88.2 cm^2

= 1411.2 cm^2

Now, cost of polishing 1cm^2 area = Rs 2.5

$\therefore$ Cost of polishing 1411.2 cm^2 = 2.5 × 1411.2 = Rs 3528

Question: 33

A kite in the sha

Solution:

We know that every square is a rhombus.

And, area of rhombus $= \frac{1}{2}$(product of diagonals)

Each of the equal diagonals = 32 cm

$\therefore$ Area of square ABCD $= \frac{1}{2}(\text{diagonal})^2$

$= \frac{1}{2} \times 32 \times 32 = 512 \text{ cm}^2$

Note: Diagonal of a parallelogram divides it into two triangles of equal areas and square is a parallelogram.

$\therefore$ Area of ΔABD = Area of ΔBDC = 1/2 area of ABCD

$= \frac{1}{2} \times 512 = 256 \text{ cm}^2$

Area of isosceles triangle CEF $= \frac{b}{4}\sqrt{4a^2 - b^2}$

Whereas, a = 6 cm and b = 8 cm

$= \frac{8}{4}\sqrt{4(6)^2 - 8^2}$

$= \frac{8}{4}\sqrt{144 - 64}$

$= 2\sqrt{80}$

$= 8\sqrt{5}$

$= 17.92 \text{ cm}^2$

Exercise : FORMATIVE ASSESSMENT (UNIT TEST)

Question: 1

Each side of an e

Solution:

It is given that,

Each side of an equilateral triangle, a = 8 cm

We know that,

Area of equilateral triangle $= \frac{\sqrt{3}}{4} a^2$

$= \frac{\sqrt{3}}{4} \times (8)^2$

$= \frac{\sqrt{3}}{4} \times 64$

$= \sqrt{3} \times 16$

$= 16\sqrt{3} \text{ cm}^2$

Also,

Area of triangle $= \frac{1}{2} \times \text{Base} \times \text{Altitude}$

$16\sqrt{3} = \frac{1}{2} \times a \times \text{Altitude}$

$16\sqrt{3} = \frac{1}{2} \times 8 \times \text{Altitude}$

∴ Altitude = $\frac{16\sqrt{3}}{4}$

= $4\sqrt{3}$ cm

Hence, altitude of the triangle is $4\sqrt{3}$ cm

Thus, option (c) is correct

Question: 2

The perimeter of

Solution:

It is given in the question that, equal sides of isosceles triangle is a

It is also given that, the given triangle is isosceles right-angled triangle

∴ AC = $\sqrt{AB^2 + BC^2}$

AC = $\sqrt{a^2 + a^2}$

AC = $\sqrt{2a^2}$

AC = a$\sqrt{2}$

We know that,

Perimeter of triangle = Sum of all sides

∴ Perimeter = (AB + BC + AC)

= (a + a + a$\sqrt{2}$)

= 2a + a$\sqrt{2}$

= a (2 + $\sqrt{2}$)

Hence, option (b) is correct

Question: 3

For an isosceles

Solution:

Let us assume ABC be an isosceles triangle having,

Base, AC = 12 cm

AB = AC = 10 cm

BD = $\frac{1}{2} \times BC$

= $\frac{1}{2} \times 12$

= 6 cm

We know that,

In right angled triangle, ABC

AD = $\sqrt{AB^2 - BD^2}$

= $\sqrt{(10)^2 - (6)^2}$

= $\sqrt{100 - 36}$

$= \sqrt{64}$

= 8 cm

Thus, height of the triangle is 8 cm

Hence, option (d) is correct

Question: 4

Find the area of

Solution:

Let us assume each side of the equilateral triangle be a

It is given that,

Side of equilateral triangle = 6 cm

We know that,

Area of equilateral triangle = $\frac{\sqrt{3}}{4}a^2$

$= \frac{\sqrt{3}}{4} \times (6)^2$

$= \frac{\sqrt{3}}{4} \times 36$

$= \sqrt{3} \times 9$

$= 9\sqrt{3}$ cm^2

Question: 5

Using Heron's for

Solution:

It is given in the question that,

Sides or triangle ABC are:

BC = 13 cm

AC = 14 cm

AB = 15 cm

We know that,

Perimeter of triangle = Sum of all sides

= AB + BC + AC

= 15 + 13 + 14

= 42 cm

$\therefore$ s $= \frac{1}{2} \times$ Perimeter of triangle ABC

$= \frac{1}{2} \times 42$

= 21 cm

Hence,

Area of $\Delta ABC = \sqrt{s\,(s-a)(s-b)(s-c)}$

$= \sqrt{21\,(21-13)(21-14)(21-15)}$

$= \sqrt{21 \times 8 \times 7 \times 6}$

$= 84 \text{ cm}^2$

Question: 6

The sides of a tr

Solution:

It is given in the question that,

Perimeter of triangle = 84 cm

Also, sides or triangle are: in ratio 13: 14: 15

Let, a = 13x

b = 14x

c = 15x

We know that,

Perimeter of triangle = Sum of all sides

84 = a + b + c

84 = 13x + 14x + 15x

84 = 42x

$x = \frac{84}{42}$

x = 2 cm

Thus, a = 13 × 2 = 26 cm

b = 14 × 2 = 28 cm

c = 15 × 2 = 30 cm

$\therefore s = \frac{1}{2} \times \text{Perimeter of triangle ABC}$

$= \frac{1}{2} \times 84$

= 42 cm

Hence,

Area of triangle $= \sqrt{s\,(s-a)(s-b)(s-c)}$

$= \sqrt{42\,(42-26)(42-28)(42-30)}$

$= \sqrt{42 \times 16 \times 14 \times 12}$

$= 336 \text{ cm}^2$

Question: 7

Find the area of

Solution:

It is given in the question that,

Sides or triangle ABC is:

BC = a = 8 cm

AC = b = 15 cm

AB = c = 17 cm

We know that,

Perimeter of triangle = Sum of all sides

= a + b + c

= 8 + 15 + 17

= 40 cm

$\therefore$ s = $\frac{1}{2} \times$ Perimeter of triangle ABC

= $\frac{1}{2} \times 40$

= 20 cm

Hence,

Area of $\Delta ABC = \sqrt{s\,(s-a)(s-b)(s-c)}$

= $\sqrt{20\,(20-8)(20-15)(20-17)}$

= $\sqrt{20 \times 12 \times 5 \times 3}$

= 60 cm^2

Also, Area of triangle ABC = $\frac{1}{2} \times$ Base $\times$ Height

60 = $\frac{1}{2} \times AB \times$ Height

120 = 17 × Height

Height = $\frac{120}{17}$

= 7.06 cm

Hence, area of triangle is 60 cm^2 and length of altitude is 7.06 cm

Question: 8

An isosceles tria

Solution:

It is given in the question that,

Equal sides of isosceles triangle = a = b = 12 cm

Also, perimeter = 30 cm

We know that perimeter of triangle = Sum of all sides

(a + b + c) = 30 cm

12 + 12 + c = 30

24 + c = 30

c = 30 – 24

= 6 cm

Hence, s = $\frac{1}{2} \times Perimeter$

s = $\frac{1}{2} \times 30$

s = 15 cm

$\therefore$ Area of triangle = $\sqrt{s\,(s-a)(s-b)(s-c)}$

$= \sqrt{15\ (15-12)(15-12)(15-6)}$

$= \sqrt{15 \times 3 \times 3 \times 9}$

$= 9\sqrt{15}\ \text{cm}^2$

Question: 9

The perimeter of

Solution:

It is given in the question that,

Perimeter of an isosceles triangle = 32 cm

Let us assume the sides of the triangle be a, b, c and a = b

We know that,

Perimeter = a + b + c

32 = a + b + c

32 = a + a + c

32 = 2a + c (i)

According to the condition given in the question, we have:

a: c = 3: 2

So, a = 3x and c = 2x

Now putting values of a and c in (i), we get

2 × 3x + 2x = 32

6x + 2x = 32

8x = 32

x = $\frac{32}{8}$

x = 4

Thus, a = 3 × 4 = 12 cm

b = 12 cm

c = 2 × 4 = 8 cm

Now, s = $\frac{1}{2} \times$ Perimeter

$= \frac{1}{2} \times 32$

= 16 cm

Area of triangle = $\sqrt{s\ (s-a)(s-b)(s-c)}$

$= \sqrt{16\ (16-12)(16-12)(16-8)}$

$= \sqrt{16 \times 4 \times 4 \times 8}$

= 4 × 4 × 2$\sqrt{5}$

= 32$\sqrt{2}$ cm^2

Question: 10

Given a ABC in wh

Solution:

I. It is given in the question that,

$\angle A$, $\angle B$ and $\angle C$ are in the ratio 3: 2: 1

Let $\angle A = 3x$

$\angle B = 2x$

$\angle C = x$

We know that, sum of angles of a triangle = 180^{o}

$\angle A + \angle B + \angle C = 180^{o}$

$3x + 2x + x = 180^{o}$

$6x = 180^{o}$

$x = \frac{180^{o}}{6}$

$x = 30^{o}$

Hence, $\angle A = 3 \times 30^{o} = 90^{o}$

$\therefore \Delta ABC$ is a right-angled triangle

II. It is also given that:

AB, AC and BC are in the ratio 3: √3: 2√3

Now, AB = 3x, AC = $\sqrt{3}x$ and BC = 2√3x

As it is given that,

AB = 3√3

$\therefore$ x = √3

AC = 3

BC = 6

Now, by using Pythagoras theorem in ΔABC we get:

$AC = \sqrt{AB^2 + BC^2}$

$3 = \sqrt{(3\sqrt{3})^2 + (6)^2}$

$3 = \sqrt{27 + 36}$

$3 \neq \sqrt{63}$

$\therefore$ The question can be answered by using either statement alone

Hence, option (b) is correct

Question: 11

In the given figu

Solution:

It is given in the question that,

AB = 120 m

AC = 122 m

BC = 22 m

BD = 24 m

And, CD = 26 m

We know that,

Perimeter of triangle = Sum of all sides

∴ Perimeter of ΔABC = AB + BC + AC

= 120 + 22 + 122

= 264 m

s = $\frac{1}{2} \times$ Perimeter (ΔABC)

= $\frac{1}{2} \times 264$

= 132 m

Now, Area (ΔABC) = $\sqrt{s\,(s-a)(s-b)(s-c)}$

= $\sqrt{132\,(132-22)(132-122)(132-120)}$

= $\sqrt{132 \times 110 \times 10 \times 12}$

= 11 × 12 × 10

= 1320 m^2

Now, in ΔBCD

BC = a, BD = b and CD = c

∴ Perimeter of ΔBCD = 22 + 24 + 26

= 72 m

s = $\frac{1}{2} \times$ Perimeter of ΔBCD

= $\frac{1}{2} \times 72$

= 36 m

Hence, area (ΔBCD) = $\sqrt{s\,(s-a)(s-b)(s-c)}$

= $\sqrt{36\,(36-22)(36-24)(36-26)}$

= $\sqrt{36 \times 14 \times 12 \times 10}$

= $6 \times 2\sqrt{420}$

= $6 \times 2 \times 2\sqrt{105}$

= $24\sqrt{105}$

= 24 × 10.25

= 246 m^2

∴ Area of shaded region = Area (ΔABC) – Area (ΔBCD)

= 1320 – 246

= 1074 m^2

Question: 12

A point O is take

Solution:

Let each side of ΔABC be a cm

So, area (ΔABC) = Area (ΔAOB) + Area (ΔAOC) + Area (ΔBOC)

$= \frac{1}{2} \times a \times ON + \frac{1}{2} \times a \times OM + \frac{1}{2} \times a \times OL$

On taking “a” as common, we get,

$= \frac{1}{2} a\,(ON + OM + OL)$

$= \frac{1}{2} \times a\,(6 + 10 + 14)$

$= \frac{1}{2} \times a \times 30$

$= 15a$ cm^2 (i)

As, triangle ABC is an equilateral triangle and we know that:

Area of equilateral triangle = $\frac{\sqrt{3}}{4} a^2$ cm^2 (ii)

Now, from (i) and (ii) we get:

$15a = \frac{\sqrt{3}}{4} a^2$

$15 \times 4 = \sqrt{3}a$

$60 = \sqrt{3}a$

$a = \frac{60}{\sqrt{3}}$

$a = 20\sqrt{3}$ cm

Now, putting the value of a in (i), we get

Area (ΔABC) = $15 \times 20\sqrt{3}$

$= 300\sqrt{3}$ cm^2